

BfR data collection on processing factors

Updated communication No 034/2019 of the BfR of 3 September 2019*

Agricultural products are often not consumed raw, but rather, processed first. This can alter the magnitude of pesticide residues that they contain. The ratio of residue in the processed product to that in the corresponding unprocessed product is known as the processing factor. It indicates whether residues are enriched or reduced during processing procedures. Processing factors are typically determined under processing conditions simulated in the laboratory. Details of such processing studies, which have to be submitted by the manufacturers of plant protection products within the scope of authorisation processes, cannot be accessed by the general public.

For this reason, since 2007, the German Federal Institute for Risk Assessment (BfR) has provided a compilation of processing factors on its website, which is regularly updated to the latest level of knowledge. The data collection is aimed primarily at a professional audience. It serves to support risk assessors in refining dietary exposure assessments for consumers as well as agricultural livestock in relation to processed food and feed. The data collection also helps the official food monitoring authorities and risk managers to assess whether the raw product a processed food was made of probably adhered to legal stipulations or not. However, the published processing factors are unsuitable as sole basis to determine the marketability of a processed product or to be used in administrative procedures. Here, a decision is required on a case-by-case basis.

The BfR has used transparent quality criteria to check every processing factor derived from a processing study. The robustness and reliability of the study results were commented on. Users can assess the significance of processing factors for themselves because relevant information on the most important parameters of the underlying studies is provided.

In November 2018, the European Food Safety Authority (EFSA) also published a database on processing factors with significant assistance from the BfR. This database contains all processing factors which were assessed by EFSA in the framework of evaluations of active substances within the EU and/or maximum residue level adjustments up until July 2016. The appraisal of studies was elaborated upon even further compared with the BfR data collection since all studies were also assessed with regard to the representativity of the chosen processing conditions and more detailed information was provided for each study. In addition, the EFSA database can easily be merged with other databases since the foods and substances have standardised codes.

The BfR has updated its data collection. Changes in residue definitions were taken into account, additional studies were included and those studies, which were already contained in the EFSA database in better quality, were removed from the BfR data collection. In future, the BfR intends to adopt for its data collection the same format and quality as the EFSA database.

Disclaimer: Despite paying the greatest care and attention when compiling the database, the BfR does not accept any liability for the correctness of the information or for any legal consequences resulting from their utilisation. The processing factors contained in the BfR data collection are not legally binding. First and foremost, the data collection should be used by professionals who are familiar with the assessment of pesticide residues in food and feed.

1 Background information on processing factors

Processing studies are conducted in order to examine the influence of processing procedures on pesticide residues in raw agricultural products. They concentrate on the most important realistic processing steps in industry and households such as peeling, pitting, blanching, cooking, puréeing and frying, the manufacture of juice, wine, beer and vegetable oils as well as the manufacture of ground cereal products. Depending on the concrete processing conditions and the physico-chemical properties of a substance, processing can lead to an increase or reduction of residue.

Processing factors are important tools which serve two main purposes: The first is in risk assessment to refine the exposure assessments for consumers and agricultural livestock in regard to pesticide residues in processed food and/or feed. The other is to equip the food monitoring authorities with information about the extent to which the residue level can alter during processing. Such information is helpful in order to be able to assess whether a processed food has been manufactured from a raw product which probably adhered to the legal maximum residue level or not. However, the processing factors published by the BfR and/or EFSA are unsuitable as sole basis to determine the marketability of a processed product or to be used in administrative procedures. Here, a decision is required on a case-by-case basis.

Experimental details of processing studies are usually not accessible to the public but rather are only available to the authorities involved in the pesticide approval procedures. Data is also collected during self-monitoring by the food companies themselves. This is also not accessible to the public.

Processing factors are derived from processing studies. They indicate the ratio of the residue in the processed product to that in the corresponding unprocessed product. An enrichment of the pesticide residue is indicated by processing factors greater than 1, whereas a reduction in the residue concentration in the processed product is expressed in a factor of less than 1.

Maximum residue levels in the EU are only established in Annexes II and III of Regulation (EC) No 396/2005 for unprocessed products such as apples, tomatoes or wheat grain, but not for processed or composite products such as apple juice or bread. [1]. The Codex Alimentarius established by FAO/WHO sets the maximum residue levels for the global movement of goods [2]. They also regulate predominantly unprocessed products, but are also established for selected processed products in cases where enrichment has taken place.

As a rule, processing studies are conducted according to the specifications of test guideline no 508 ("Magnitude of the Pesticide Residues in Processed Commodities") [3] published by the OECD and the OECD Guidance Document on Magnitude of Pesticide Residues in processed commodities [4]. These guidelines do not stipulate any specific process parameters which need to be taken into account during lab tests. Indeed, it is generally much more recommended to simulate conditions which reflect typical processes in the food processing industry. This results in a high variability of the test conditions, and thereby also of the results, which have to be taken into account when interpreting the processing factors.

2 BfR data collection on processing factors

The BfR data collection on processing factors has existed since 2007 and is regularly updated to correspond with the current level of knowledge. First and foremost, it contains factors from processing studies which were submitted to the BfR in the course of pesticide approval or authorisation procedures. Additionally, it contains factors from sources accessible to the public such as the reports on the assessment of pesticide residues published each year by the FAO/WHO Joint Meeting on Pesticide Residues (JMPR). In the past, it also contained countless factors which were assessed in the course of evaluations of active substances within the EU and/or maximum residue level adjustments. Most of these studies were removed from the BfR data collection in the course of the update since they were already contained in better quality and with more up to date assessments in the EFSA database (refer to 3). Furthermore, it takes into account the information on the distribution of residues between the peel and the pulp of citrus fruits, which was reported in the framework of national monitoring programmes [5] and/or gained from trading companies during self-monitoring [6] and made available to the BfR.

In addition, first processing data from self-monitoring in the food and feed processing industry other than pulp/peel distributions, was also added to the BfR data collection and assessed according to the same quality criteria as conventional processing studies. The BfR provides a data submission sheet to submit such information from self-monitoring, which can be found under the following link to the BfR website:

<https://www.bfr.bund.de/cm/349/bfr-compilation-of-processing-factors-submission-sheet.docx>

The BfR welcomes any expansion to the database through the integration of self-monitoring data. The more data it contains the more realistic and significant the resulting processing factor.

Aside from the processing factors, the BfR data collection also contains countless additional information such as on the validity of the analytical method or on the storage conditions of samples, so that the significance of every processing factor can be evaluated by the users themselves. Where several processing factors from various individual tests were reported for the same processed product in a study, the median is listed in the data collection together with the span of individual values. More details on the structure and content of the data collection and the interpretation of the data can be taken from a publication [7].

The BfR has updated its data collection. Changes in residue definitions were taken into account, additional studies were included and those studies already contained in the EFSA database in better quality (refer to point 3) were removed from the BfR data collection.

The BfR database can be accessed on the BfR website under the following link:

<https://www.bfr.bund.de/cm/349/bfr-compilation-of-processing-factors.xlsx>

The BfR data collection is regularly updated. The long-term goal is to adjust the data collection to the same format and quality as the EFSA database (refer to 3) and, together with this one, create one EU harmonised data collection.

3 EFSA database on processing factors

In November 2018, EFSA published a database on processing factors, which the BfR put together with other European institutes on behalf of EFSA. This database contains all processing factors which were assessed by EFSA in the framework of evaluations of active substances within the EU and/or maximum residue level adjustments and reviews up until July 2016. The appraisal of studies was refined even further compared with the BfR data collection since all studies were also assessed with regard to the representativity of the selected processing conditions and more detailed information was provided for each study. In addition, the EFSA database has the advantage of easily being merged with other databases since the foods and substances have standardised codes.

The database compilation project comprised three parts:

- Part 1: Compiling the most important processing procedures in food processing including the description of representative process flows and conditions [8]
- Part 2: Coding the processing procedures and products according to the EFSA FoodEx2 system in order to simplify later links to consumption and monitoring data [9]
- Part 3: Setting up an Excel based database of processing factors from regulatory studies [10]. All studies were newly assessed in regard to their quality and significance.

The EFSA database can be accessed on the EFSA website under the following link:

<https://zenodo.org/record/1488653>

4 Graphic illustration of typical processing procedures

Furthermore, the BfR provides a graphic illustration of typical processing procedures in the form of flow charts. Users of the data collection can therefore gain a quick overview of the relevant products and intermediate products from processing procedures and more easily assign processed matrices.

The flow charts can be accessed on the BfR website under the following link:

<https://www.bfr.bund.de/cm/349/bfr-compilation-of-processing-factors-flow-charts.pdf>

5 References

[1] EC (2005), Regulation (EC) No 396/2005 of the European Parliament and of the Council of 23 February 2005 on maximum residue levels of pesticides in or on food and feed of plant and animal origin and amending Council Directive 91/414/EEC, OJ L 70/1, 16.3.2005

[2] Codex Alimentarius (2018), Codex Pesticides Residues in Food Online Database, <http://www.fao.org/fao-who-codexalimentarius/codex-texts/dbs/pestres/en/> (accessed 01.07.2019)

[3] OECD (2008), Test No. 508: Magnitude of the Pesticide Residues in Processed Commodities, OECD Guidelines for the Testing of Chemicals, Section 5, OECD Publishing, Paris, <https://doi.org/10.1787/9789264067622-en> (accessed 01.07.2019)

[4] OECD (2008), Series on Testing and Assessment No 96: Guidance Document on Magnitude of Pesticide Residues in processed commodities, 29 Jul 2008, [http://www.oecd.org/officialdocuments/displaydocument/?cote=env/jm/mono\(2008\)23&doclanguage=en](http://www.oecd.org/officialdocuments/displaydocument/?cote=env/jm/mono(2008)23&doclanguage=en) (accessed 01.07.2019)

[5] BVL (2011), Berichte zur Lebensmittelsicherheit 2011 - Monitoring, [doi:10.1007/978-3-0348-0580-3](https://doi.org/10.1007/978-3-0348-0580-3)

[6] Ahlers, W., Reichert, T. (2007), Oberflächen-Konservierungsstoffe und Akute Referenzdosis - Ergebnisse einer Testreihe bei Zitrusfrüchten, Kooperation des lebensmittelchemischen Untersuchungsrings des Landesverbands Baden-Württemberg des Früchte-Import- und -Großhandels e.V. und der Atlanta AG (heute: Univeg Deutschland GmbH)

[7] Scholz et al. (2016), Compilation of Processing Factors and Evaluation of Quality Controlled Data of Food Processing Studies. Accepted: 29 July 2016, published online: 6 September 2016. *J Consum Prot Food Saf* (2017) 12:3–14, DOI 10.1007/s00003-016-1043-3

[8] EFSA (2018), Database of processing techniques and processing factors compatible with the EFSA food classification and description system FoodEx 2. Objective 1: Compendium of Representative Processing Techniques investigated in regulatory studies for pesticides, <https://efsa.onlinelibrary.wiley.com/doi/abs/10.2903/sp.efsa.2018.EN-1508> (accessed 01.07.2019)

[9] EFSA (2018), Database of processing techniques and processing factors compatible with the EFSA food classification and description system FoodEx2 related to pesticide residues. Objective 2: Linking the processing techniques investigated in regulatory studies with the EFSA food classification and description system FoodEx2, <https://efsa.onlinelibrary.wiley.com/doi/abs/10.2903/sp.efsa.2018.EN-1509> (accessed 01.07.2019)

[10] EFSA (2018), Database of processing techniques and processing factors compatible with the EFSA food classification and description system FoodEx 2. Objective 3: European database of processing factors for pesticides in food, <https://efsa.onlinelibrary.wiley.com/doi/abs/10.2903/sp.efsa.2018.EN-1510> (accessed 01.07.2019)

This text version is a translation of the original German text which is the only legally binding version.